CLAIMS

1. A system comprising:

an electrochemical unit configured to utilize first and second reactants to generate an electrical current;

at least one relatively low voltage electrical device operatively coupled to said electrochemical unit;

at least one relatively high voltage electrical device operatively coupled to said electrochemical unit;

control circuitry operatively coupled to said relatively low voltage electrical device and said relatively high voltage electrical device, wherein

said control circuitry comprises a high voltage region and a low voltage region,

said high voltage region comprises electrical components configured for operation at higher voltages than electrical components of said low voltage region, and

electrical components of said high voltage region and electrical components of said low voltage region are positioned such that, absent EMI shielding structure between said high and low voltage components, a substantial amount of EMI from said high voltage components would be induced in said low voltage components; and

an EMI shielding structure configured to define a conductive enclosure about said high voltage region and said low voltage region and a conductive EMI barrier between said high voltage region and said low voltage region.

2. A system as claimed in claim 1 wherein said conductive enclosure defined by said EMI shielding structure surrounds substantially all of said control circuitry.

3. A system as claimed in claim 1 wherein said conductive enclosure defined by said EMI shielding structure comprises at least one connector inlet.

4. A system as claimed in claim 3 wherein said conductive enclosure comprises a high voltage connector inlet and a low voltage connector inlet.

5. A system as claimed in claim 4 wherein said high and low voltage connector inlets are positioned to minimize EMI in low voltage connectors passing through said low voltage connector inlet from high voltage connectors passing through said high voltage connector inlet.

6. A system as claimed in claim 4 wherein said conductive enclosure is mechanically coupled to said high voltage electrical device and is oriented to minimize a distance between said high voltage connector inlet and said high voltage electrical device.

7. A system as claimed in claim 1 wherein said shielding structure is configured such that at least one printed circuit board comprising said high and low voltage regions of said control circuitry may be secured to said shielding structure.

8. A system as claimed in claim 1 wherein said shielding structure defines a high voltage compartment and a low voltage compartment separated by said conductive EMI barrier between said high voltage region and said low voltage region.

9. A system as claimed in claim 8 wherein said shielding structure defines a plurality of high voltage compartments, a plurality of low voltage compartments, or combinations thereof.

10. A system as claimed in claim 1 wherein:

said conductive enclosure defined by said shielding structure defines an exterior wall structure; and

said conductive EMI barrier forms an interior wall structure of said conductive enclosure.

11. A system as claimed in claim 10 wherein said interior wall structure formed by said conductive EMI barrier is configured to enhance structural integrity of said enclosure.

12. A system as claimed in claim 10 wherein said interior wall structure and a printed circuit board upon which said control circuitry is arranged define complementary male and female engaging surfaces.

13. A system as claimed in claim 12 wherein said complementary male and female engaging surfaces comprise a pin on said interior wall structure and a hole in said printed circuit board.

14. A system as claimed in claim 10 wherein said exterior wall structure and said interior wall structure are configured to sink heat generated in said control circuitry.

15. A system as claimed in claim 14 wherein said exterior wall structure comprises a coolant passage.

16. A system as claimed in claim 14 wherein said exterior wall structure is thermally coupled to a cooling element.

17. A system as claimed in claim 1 wherein said shielding structure is secured to said relatively high voltage electrical device.

18. A system as claimed in claim 17 wherein said shielding structure is secured to said relatively high voltage electrical device via mounting hardware

19. A system as claimed in claim 17 wherein said shielding structure is secured directly to said relatively high voltage electrical device.

20. A system as claimed in claim 1 wherein said shielding structure comprises a significant amount of aluminum.

21. A system as claimed in claim 1 wherein said control circuitry is operatively coupled to a single high voltage electrical device.

22. A system as claimed in claim 1 wherein said control circuitry is operatively coupled to a plurality of high voltage electrical devices.

23. A system as claimed in claim 1 wherein said high voltage region and said low voltage region of said control circuitry are defined on a common printed circuit board.

24. A system as claimed in claim 1 wherein said high voltage region and said low voltage region of said control circuitry are defined on at least one printed circuit board.

25. A system as claimed in claim 24 wherein:

said printed circuit board comprises at least one conductive trace; and

said shielding structure includes components aligned with said conductive trace.

26. A system as claimed in claim 25 wherein said conductive EMI barrier is aligned with said conductive trace.

27. A system as claimed in claim 25 wherein:

said shielding structure defines an exterior wall structure and an interior wall structure; and

at least a portion of said exterior wall structure and said interior wall structure is aligned with said conductive trace.

28. A system as claimed in claim 1 wherein said electrical components of said high voltage region are configured for operation at electrical currents that are at least one order of magnitude greater than operational currents of said electrical components of said low voltage region.

29. A system as claimed in claim 1 wherein said electrical components of said high voltage region are configured for operation at voltages that are at least one order of magnitude greater than said operational voltages of said electrical components of said low voltage region.

30. A system as claimed in claim 29 wherein said electrical components of said high voltage region are configured for operation at amperometric currents of above about 10 Ampere.

31. A system as claimed in claim 30 wherein said electrical components of said high voltage region are configured for operation at amperometric currents of up to about 700 Ampere.

32. A system as claimed in claim 29 wherein said operational voltages of said high voltage region are above about 450 V and said operational voltages of said low voltage region are below about 5 V.

33. A system as claimed in claim 1 wherein said high voltage device is selected from a motor, a compressor, a heating element, a cooling system, a DC/DC converter, a fan module, and combinations thereof.

34. A system as claimed in claim 1 wherein said high voltage device comprises a blower configured to supply a reactant to said electrochemical unit.

35. A system as claimed in claim 1 wherein said low voltage device comprises a sensor.

36. A system as claimed in claim 35 wherein said sensor is configured to detect a drive train condition of a vehicle.

37. A system as claimed in claim 35 wherein said sensor is configured to detect an operating condition of said system.

38. A system as claimed in claim 35 wherein said sensor is configured to detect an operating condition of a motor vehicle.

39. A system as claimed in claim 1 wherein said first reactant comprises a hydrogenous fuel source and said second reactant comprises an oxidant.

40. A vehicle comprising:

an electrochemical unit configured to utilize a first reactant from a hydrogenous fuel source and a second reactant in the form of an oxidizing reactant to generate an electrical current, wherein said electrochemical unit is further configured to function as a source of motive power for said vehicle;

at least one relatively high voltage electrical device operatively coupled to said electrochemical unit;

a relatively low voltage sensor operatively coupled to said electrochemical unit;

control circuitry operatively coupled to said relatively low voltage electrical sensor so as to input a relatively low voltage signal from said sensor and operatively coupled to said relatively high voltage electrical device so as to output a relatively high voltage control signal to said device, wherein

said control circuitry comprises a high voltage region including circuitry for generating said high voltage control signal and a low voltage region including circuitry for processing said low voltage sensor signal,

said high voltage region and said low voltage region of said control circuitry are defined on a common printed circuit board, and

electrical components of said high voltage region and electrical components of said low voltage region are positioned on said printed circuit board such that, absent EMI shielding structure between said high and low voltage components, a substantial amount of EMI from said high voltage components would be induced in said low voltage region; and

an EMI shielding structure configured to define a conductive enclosure about said high voltage region and said low voltage region and a conductive EMI barrier between said high voltage region and said low voltage region, wherein

said conductive enclosure defined by said EMI shielding structure comprises a high voltage connector inlet and a low voltage connector inlet,

said high voltage connector inlet and said low voltage connector inlet are positioned to minimize EMI in low voltage connectors passing through said low voltage connector inlet from high voltage connectors passing through said high voltage connector inlet,

said conductive enclosure is mechanically coupled to said high voltage electrical device and is oriented to minimize a distance between said high voltage connector inlet and said high voltage electrical device,

said conductive enclosure is configured to sink heat generated in said control circuitry, and

said shielding structure defines a high voltage compartment and a low voltage compartment separated by said conductive EMI barrier between said high voltage region and said low voltage region.

41. A vehicle comprising:

an electrochemical unit configured to utilize a first reactant from a hydrogenous fuel source and second reactant in the form of an oxidizing reactant to generate an electrical current, wherein said electrochemical unit is further configured to function as a source of motive power for said vehicle;

at least one relatively high voltage electrical device comprising a blower configured to supply a reactant to said electrochemical unit;

a relatively low voltage sensor configured to detect a drive train condition of said vehicle;

control circuitry operatively coupled to said relatively low voltage electrical sensor so as to input a relatively low voltage signal from said sensor and operatively coupled to said

relatively high voltage electrical device so as to output a relatively high voltage control signal to said device, wherein

said control circuitry comprises a high voltage region including circuitry for generating said high voltage control signal and a low voltage region including circuitry for processing said low voltage sensor signal,

said high voltage region and said low voltage region of said control circuitry are defined on a common printed circuit board comprising at least one conductive trace,

electrical components of said high voltage region are configured for operation at electrical currents that are at least one order of magnitude greater than operational currents of electrical components of said low voltage region,

said electrical components of said high voltage region are configured for operation at voltages that are at least one order of magnitude greater than said operational voltages of said electrical components of said low voltage region, and

said electrical components of said high voltage region and said electrical components of said low voltage region are positioned on said printed circuit board such that, absent EMI shielding structure between said high and low voltage components, a substantial amount of EMI from said high voltage components would be induced in said low voltage region; and

an EMI shielding structure configured to define a conductive enclosure about said high voltage region and said low voltage region and a conductive EMI barrier between said high voltage region and said low voltage region, wherein

said conductive EMI barrier is aligned with said conductive trace,

said conductive enclosure defined by said EMI shielding structure comprises a high voltage connector inlet and a low voltage connector inlet,

said high voltage connector inlet and said low voltage connector inlet are positioned to minimize EMI in low voltage connectors passing through said low voltage connector inlet from high voltage connectors passing through said high voltage connector inlet,

said conductive enclosure is mechanically coupled to said high voltage electrical device and is oriented to minimize a distance between said high voltage connector inlet and said high voltage electrical device,

said conductive enclosure is configured to sink heat generated in said control circuitry, and

said shielding structure defines a high voltage compartment and a low voltage compartment separated by said conductive EMI barrier between said high voltage region and said low voltage region.